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ABSTRACT

To support informational needs of day-to-day and long-range decision-making, many universities have developed their own data collection devices and institutional reporting systems. Often these models only represent a single point in time and do not effectively support needs at college and departmental levels. This paper identifies some of the more prevalent problems encountered with higher level information models and discusses Higher Education Planning Systems (HEPS) as a viable alternative that will serve all organizational levels. HEPS's reports are produced at several levels of aggregation and display data for several time periods. A technical overview of the HEPS subset is presented as implemented by the University of Toledo, utilizing data from the College of Business Administration. Costing methodology is the fulcrum of a planning process designed to affect budgeting. The manner of recording courses that span multiple instructional levels and the method of representing faculty work load are essential to costing the components of instruction. Two methods of recording faculty work load were tested in HEPS: (1) assigned work load and (2) diary type of work load. Reactions and comments from different levels within the University and proposed future uses for this system are discussed. (Author/JMD)

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HE 010 612

MULTI-LEVEL INFORMATION SYSTEMS

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Abstract

To support informational needs of day-to-day and long range decision making, many universities have developed their own data collection devices and institutional reporting systems. Often these models only represent a single point in time and do not effectively support needs at college and departmental levels. This paper identifies some of the more prevalent problems encountered with higher level information models and discusses HEPS - Higher Education Planning Systems - as a viable alternative that will serve all organizational levels. HEPS' reports are produced at several levels of aggregation and display data for several time periods. We present a technical overview of the HEPS subset, as was implemented by The University of Toledo, utilizing data from the College of Business Administration.

Costing methodology is the fulcrum of a pla ing process designed to affect budgeting. The manner of recording courses that span multiple instructional levels and the method of representing faculty work load are essential to costing the components of instruction. Two methods of recording faculty work load were tested in HEPS: 1) assigned work load and 2) diary type of work load. We present reactions and comments from different levels within the University and our proposed future uses for this system.

Multi-Level Information Systems

Much development has taken place in recent years in comprehensive, quantitative, planning and management information systems, and they have been compared in the literature. However, this paper identifies some of the procedures which should prove helpful in the selection, installation, and use of a planning and management system primarily focused on instructional indices.

The Need for Comprehensive Multi-Level Reporting

The need for quantitative information is usually motivated by inquiries from central administration or from sources outside the university, such as state coordinating and governing agencies. In an effort to comply with these demands, colleges and universities have developed extensive data retrieval systems. Since most informational requests are eventually handled through "mid-administration" offices or the institutional research office, data processing systems are designed to meet their needs. Often these systems are not as functional in other offices or departments.

Very little progress has been made in supplying information to lower levels of administration within the university, (i.e., college deans and departmental chairmen). Since these levels are the primary sources for data within the university, the resultant data base represents lower managements' perception of information that may be useful at higher levels. Because of the urgency of most requests,

cycling back the information for verification is usually too time consuming and is often omitted altogether. This situation has tended to stratify the university with regard to the supply of report information in one instance, and the use of management information for evaluation and planning in another. Management reporting systems should be designed to meet requirements of multiple levels of organization structures.

But organizational level is only one dimension of a comprehensive management information system. The second dimension is that of time. Management information reports are usually created from ongoing operating or transactional systems, such as a student record system or a payroll-personnel system. The management information system must utilize a "snapshot" of the operating system at some point in time. But a snapshot at a single point in time can only describe one instance of any event. It cannot give necessary historical background or trend information. For example, if we were to say that the College of Arts and Sciences has an enrollment of 900 FTE, is this descriptive enough of the total reality to adequately plan for the college? Nine hundred FTE is certainly a descriptive statement relating to the college, but it falls short of providing the information necessary for the determination of future needs and resources of the college. However, if we can display the enrollments in the College of Arts and Sciences over several years, we might be able to identify the trends in growth. These trends bring us somewhat closer to describing realities about the college and thus help us plan for the future.

A university is composed of many diverse operating systems which should not operate in isolation. Therefore a comprehensive planning and management system must display integrated information from these other systems across multiple organizational levels and time periods. (Figure 1)

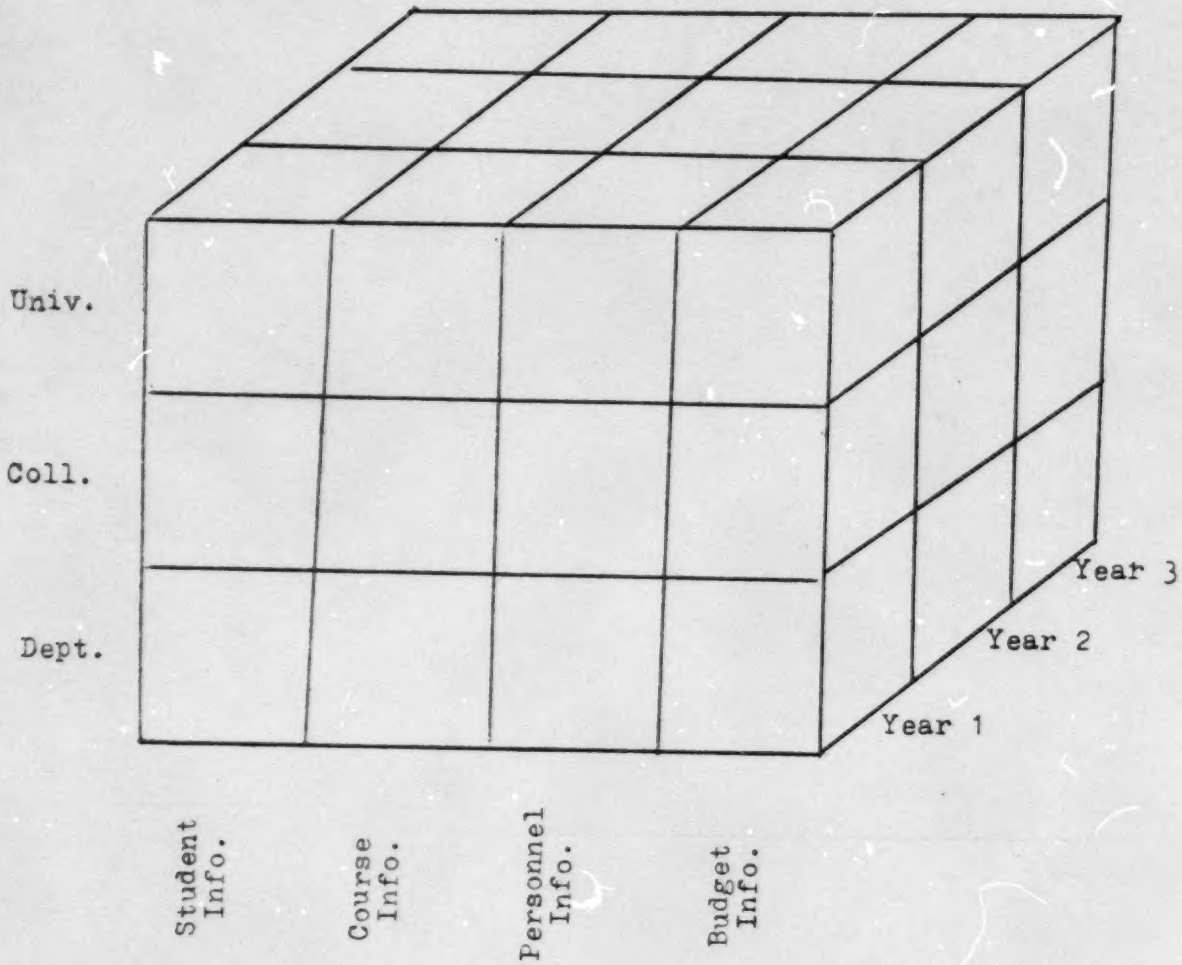
Problems with Models

The use of an institutional research model at lower departmental levels has some inherent problems: 1) it is usually designed to aggregate or give a simplified view of the data; 2) its output is often printed in a format that is not directly related to organizational or departmental structures; 3) the use of special codes, abbreviations and acronyms make it difficult for non-analysts to use. Anyone who has had the experience of trying to explain to a departmental chairman what is meant by "PID" on an NCHEMS report can relate to this problem; 4) the institutional research model may not display the reality that is needed for lower level planning and management due to timing and definitional problems, sequencing of events, the desire of a departmental chairman to supply information that will optimize the perception of his department, or a host of other reasons; 5) reports usually represent only one time period, thus longitudinal study will involve laying several reports side by side and manually extracting information.

The HEPS Encounter

In early 1977 The University of Toledo purchased from Education and Economic Systems, Inc. (EES), a subset of their Higher Education Planning System (HEPS). Our emphasis was on supplying management reports to several levels within the instructional area. HEPS was chosen because it came closest to solving as many of the foregoing

Figure 1
Management Information Cube



problems as could reasonably be expected in a "purchased system."

HEPS first provides a series of assessment reports at a course/section level. Simultaneously it generates more aggregate reports at both the college and university levels. This helps to guarantee that all levels within the university will have numbers generated from the same data base, at the same time, and that they can be audited back to the details of course and section. This also provides the individual departments with the detailed data that the administration has identified as being "official data." (Figure 2)

Most HEPS reports have few extraneous codes or abbreviations. Departmental and account codes have all been decoded to give their alphabetic names. External or extraneous codes not a part of the university, as imposed by other agencies, are completely omitted from these reports. This may be a two edged sword. Since HEPS reports are not designed to display information according to other constructs, a manual transformation must occur in order to conform or balance to reports used outside the university.

HEPS is a comprehensive system which identifies and displays cost by major discipline objectives. These costs must ultimately be reconciled with accounting control totals. Because of this there is a greater incentive for faculty or chairmen to properly identify and code resource expenditures. For example, if educational expenses are reported to be low in instruction, an offsetting high expense item will likely be found in another program or activity, such as departmental administration, public service, advising, etc.

Because HEPS reports are derived from historical snapshots of data,

Figure 2

Multi-Level
7

HIGHER EDUCATION PLANNING SYSTEM

FACULTY SALARY COSTS PER COURSE

RPT 22-02
FALL
11/15/77

INSTITUTION UNIVERSITY OF TOLEDO
COLLEGE BUSINESS
DEPARTMENT ACCOUNTING

COURSE	SECTION	COURSE COST 1976	1977	1978	COST PER STUDENT CREDIT HOUR 1976	1977	1978	COST PER CONTACT HOUR 1976	1977	1978
LOWER DIVISION										
150										
	01	1,247			7.42			311		
	02	1,283			7.13			320		
	03	500			2.91			125		
	04	1,283			6.97			320		
	05	800			5.41			200		
	06	1,569			7.00			392		
	07	800			3.64			200		
	08	800			5.13			200		
	09	2,118			22.06			[illegible]		
TOTAL COURSE		10,400			6.72			288		
190										
	01	1,283			6.97			320		
	02	1,247			8.43			311		
	03	1,247			6.36			311		
	04	800			5.26			200		
TOTAL COURSE		4,577			6.73			286		
TOTAL LOWER DIVISION		14,977			6.72			288		

HIGHER EDUCATION PLANNING SYSTEM

FACULTY SALARY COSTS PER COURSE
CREDIT HOUR, CONTACT HOUR
SUMMARY I

PAGE 1
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FALL
11/15/77

INSTITUTION UNIVERSITY OF TOLEDO
COLLEGE BUSINESS
DEPARTMENT ACCOUNTING

	COURSE COST 1976	1977	1978	COST PER STUDENT CREDIT HOUR 1976	1977	1978	COST PER CONTACT HOUR 1976	1977	1978
TOTAL DEPARTMENT									
LOWER DIVISION	14,977			6.72			288		
UPPER DIVISION	31,611			13.19			486		
MASTER	3,246			9.33			270		
DOCTOR									
PROFESSIONAL									
TOTAL	49,834			10.02			386		

they have the capability and format to display up to three periods side by side on a given report. This facilitates basic trend analysis and longitudinal studies. Most studies which look at trends over given periods of time are as concerned with percentages as they are with numeric values. In light of this, HEPS displays most reports in two quantifications, percentages and numeric counts.

Technical Look at HEPS

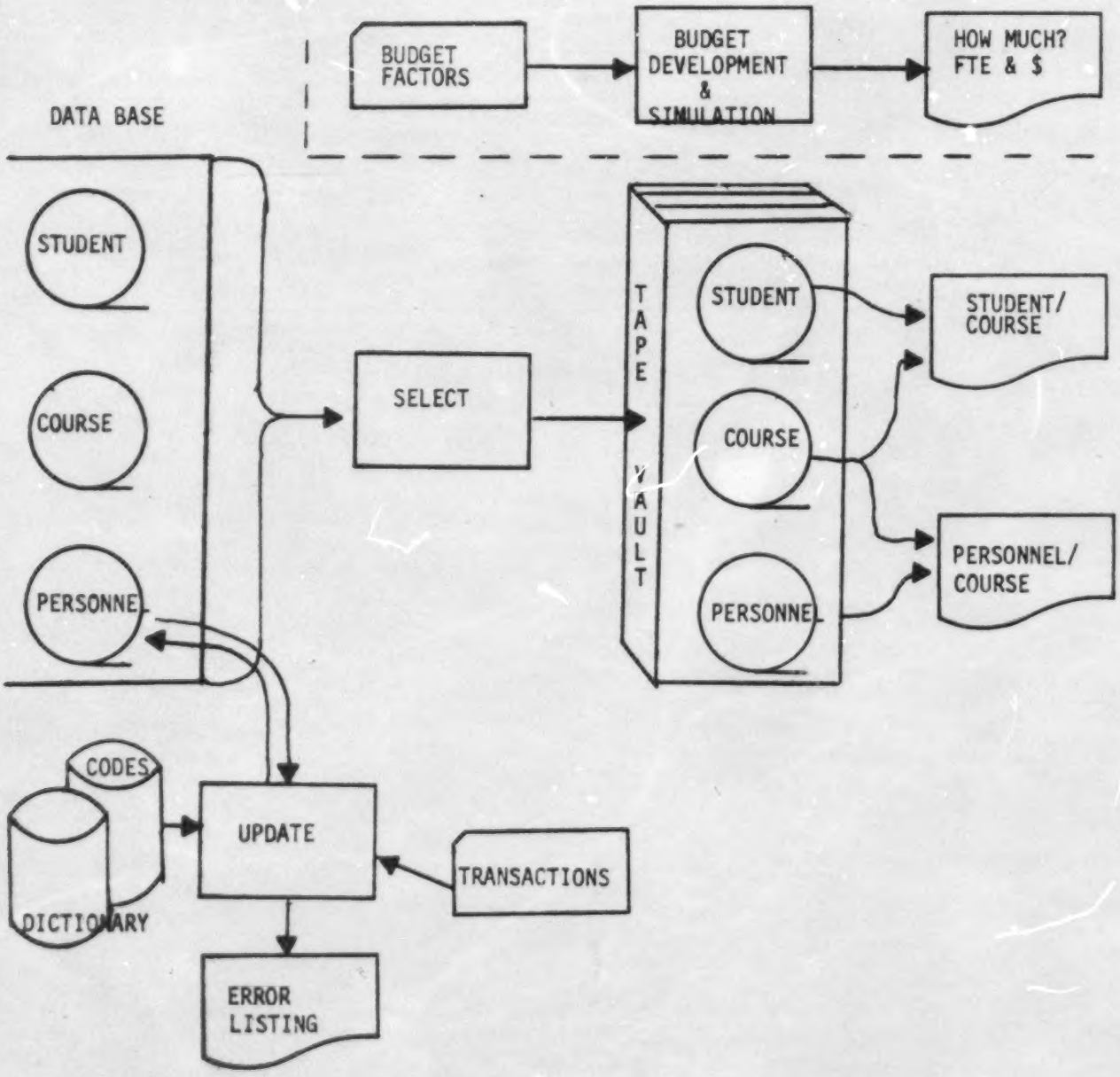
As is the case at many other universities, financial considerations dictated limitations on what we could purchase in our HEPS package. We omitted those reports which were in part generated from other systems and still had what we considered to be a manageable subset which would supply pertinent information in a timely manner.

Because HEPS generates reports from a series of historical files, snapshots of the three major files (student, course, and personnel) are maintained in a vault in the same format. It is in this fashion that up to three periods of data can be displayed on a single report. Although this concept is not unique to HEPS, the support system which generates this model is somewhat unique in packaged planning systems. (Figure 3)

The quality of any planning system is only equal to the quality and availability of the basic, institutional data base. Therefore, HEPS puts a great emphasis on the institutional data base. In cases where this is incomplete HEPS provides a data management system. This system is dictionary driven and has maintenance capability. The dictionary defines data elements which are present on the master file. HEPS also provides a codes description file which defines all necessary codes for the college. It is used to validate codes information before

Figure 3

THE UNIVERSITY OF TOLEDO
HIGHER EDUCATION PLANNING SYSTEM



entering the data base. Also in the codes file are conversion tables defining levels of aggregation.

HEPS also has a Parameter Generated Budget Module that is quite apart from the system which generates reports from the HEPS history vault. This module is not driven by master files. It is instead a card driven system which contains budget factors and other variables such as expected student credit hours by level of instruction, faculty salaries and FTE, faculty work load and support staff, and other resource formulas. The output of this is a set of budget documents displaying "how much" is necessary to support a particular department or college. EES also developed a sophisticated librarian system which greatly facilitates the actual installation of their computer programs. This system, called EESYLIB, has been utilized in many other administrative applications at the university, in addition to HEPS.

Other elements of the total HEPS system which were not purchased by The University of Toledo were the Budget Development Module, the Facilities Module, and their simulation module.

HEPS Implementation

Without getting into tedious detail, we may say that the actual installation of the HEPS programs proceeded with relatively few problems, considering that the system contains over 85 computer programs. Of course a typical range of start up problems were encountered.

Many of the initial issues involving report headings, data element definitions, and data aggregations were identified and resolved in a one day "on site" visit by EES. In this "initial decision" phase the the primary players, such as Vice Presidents, Management Information Service and Data Processing Directors, were involved. Although

the concept of forcing key administrators to make decisions and commitments as a group before further installation proceeds is a good idea; it also has a drawback. Once a decision is made and EES has implemented the decision, it then becomes difficult to change this decision at a later date. Perhaps a better term for this "initial decisions" phase should be "final decisions." In any case, an implementation of this nature would certainly consume a great deal more time without the external force of an outside vendor precipitating these decisions. It also places the burden of responsibility for these decisions directly upon upper administration, and not solely on programming or lower level staff.

In order to control the physical amounts of data and data collection, we also decided to pilot only the College of Business Administration. Our choice of this particular college was partially based on the fact that the College of Business Administration had been maintaining a large portion of support data which could be used for validation.

In addition to activities in the initial decisions phase, we have discovered two other issues that are complex and philosophical. The first is the concept of split courses. The University of Toledo has a large number of courses that may, depending on the status of the enrolling student, be taken for either undergraduate, masters, or doctoral credit but are essentially one class taught as a group by one faculty member. Within these courses, all three levels are often present. Logic dictates that if we look at section size analysis alone, then these courses must be mapped into a primary course section. If not, we could have many sections with only one or two students enrolled.

But in actuality this would not be the case. If our analysis displays the distribution of student credit hours taught by course level, it is necessary to keep the courses separate. Unfortunately, HEPS requires that either method, but not both, be represented in the history files. It is possible to run the programs that generate the history files twice. One run would aggregate the courses and one would leave the courses as separate entities, thus maintaining both in separate history files. But this is an inefficient data management technique and also quite expensive.

In our HEPS subset we have relatively few reports by student classification, and quite a few by section and section type. Thus our "initial decision" was to map the courses into a primary course, usually the lowest course number of the sequence. After seeing our own data in HEPS reports, we have certain misgivings. One entire series of reports distributes faculty teaching load by level of instruction. Since all multiple level courses are mapped to the lowest level, our reports show that in certain departments there is no graduate level instruction!

The second problem involves the assessment of faculty work load. The Ohio Board of Regents requires each institution to generate faculty work load in terms of hours per week by activity type, (i.e., teaching, departmental research, public service, etc.). On the other hand, EES feels that the concept of "assigned time" is more relevant to budget planning and control. It is possible to computer generate the "assigned" work load for instructional activities. But there is no machine readable information regarding the assigned time for other activities such as advising or administration.

Since this was not an issue to be resolved in an initial decision fashion, we designed the system to accept both types of work load indicators. Although this may be cumbersome, and for the time being requires the maintenance of two history files, it does provide a technically feasible solution to the problem.

After hand gathering and coding the assigned work load data, both sets of data were input to the HEPS system for the pilot college. As expected, the diary type analysis proved to be subjective. Although the assigned work load analysis brought us closer to information that could be used internally, it was also subjective and open to interpretation. The manner in which one dean assigns and gives work credit for an activity might not be the same as that of another dean. In this case, the problem becomes one of definition rather than of technical constraint.

Since the Ohio Board of Regents is requiring one type of work load reporting and our experiences may show that internal reporting is better served by assigned work load, an unresolved problem will persist until the pilot test is concluded. Although these problems are not new to higher education, and certainly not to this group, economies require some kind of resolution.

HEPS Uses

We currently have two years of HEPS data for the College of Business Administration. And for the first time we are in the process of generating reports for the other seven colleges at the University. Some of our initial problems of section size and work load seem to have only scratched the surface. Although the College of Business Administration was desirable as a pilot college, it didn't have certain

complexities of instructional type that are found in other colleges. Since each course was designated as either lecture or independent study, a more complex mix of instructional design could not be tested.

In our original HEPS system we did not purchase the programs designed to create reports for non-instructional personnel. We did however design the personnel master file such that this segment of the University could physically be included in the file. As a result, we have in HEPS a fairly complete file with all personnel data maintained. Although not mentioned earlier, the HEPS Master file also has a Variable Report Generator associated with it. Thus we are able to generate basic personnel reports for the entire University. Within the structure of the Personnel Master File we included a position control code which can track not only individuals, but also authorized positions. By using the VRG and the position control code we are able to generate seniority and affirmative action reports.

As part of the original contract with EES, their personnel will make a final presentation and discussion of the HEPS reports for the pilot college. This will involve the President and top administrators in an effort to gain understanding and backing at the outset. We expect the final decisions regarding faculty work load, split courses, and other problems to be resolved at that time. We are only now beginning to utilize this system in its fullest capacity.